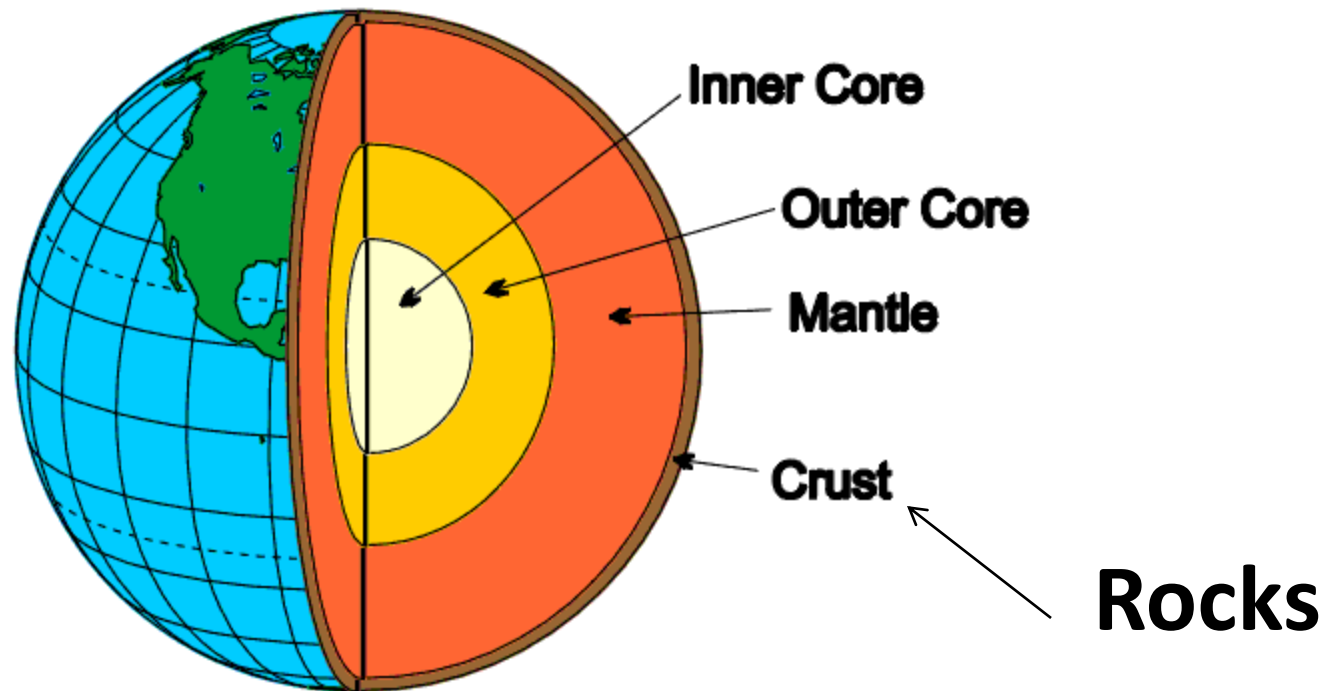


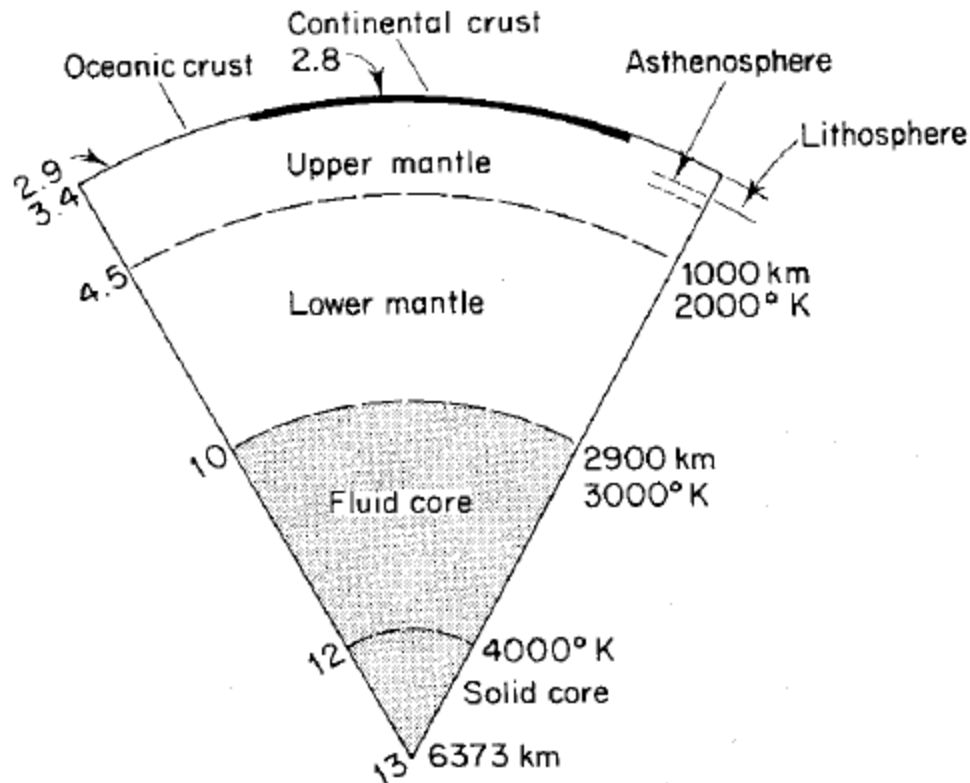
# Engineering Geology

## Lecture-2

# Internal Structure of the Earth



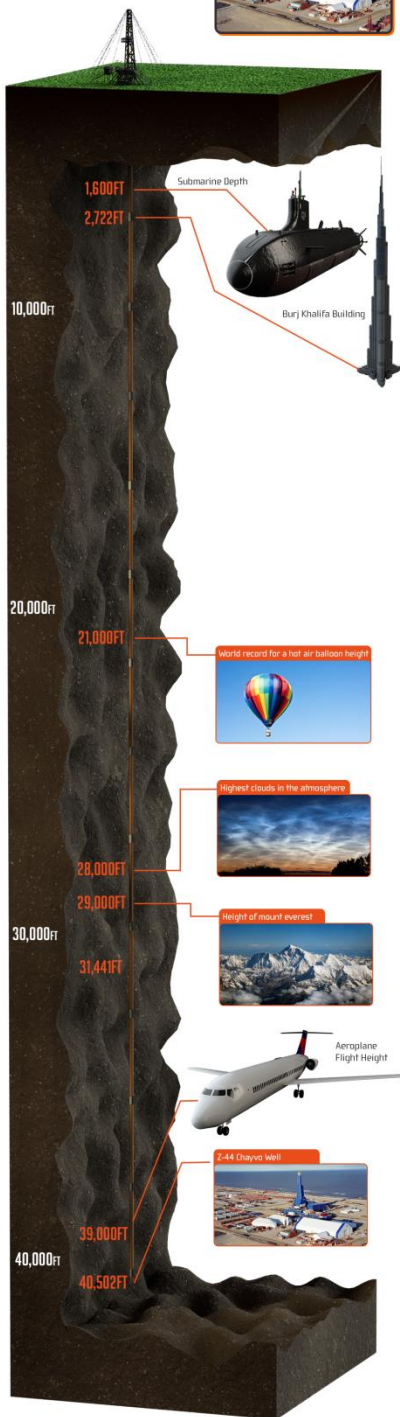
# Internal Structure of the Earth



Further details:

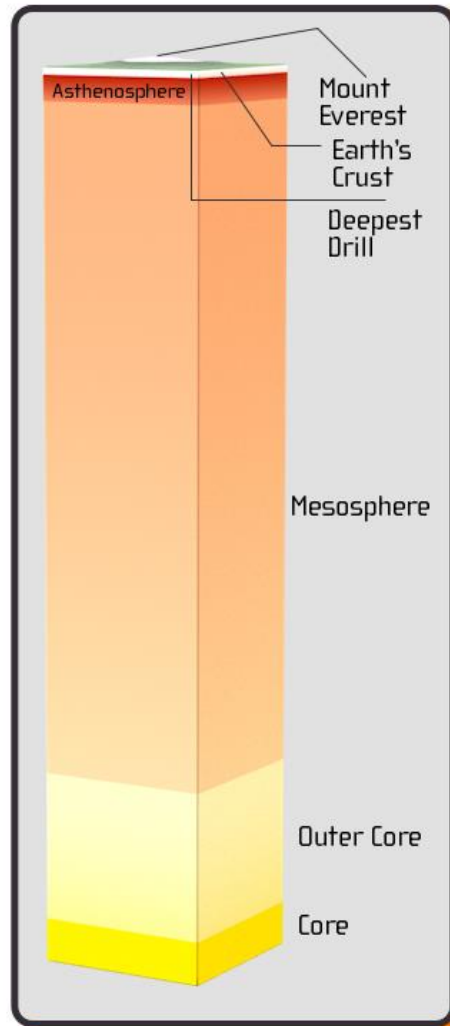
<https://geology.com/nsta/earth-internal-structure.shtml>

**Fig. 1.3** Composition of the Earth (after Bott, 1982); depths from surface in km; temperature scale in degrees K; figures on left are mass density in  $10^3 \text{ kg m}^{-3}$ .



Average oil well depth ~ 5800 ft (1.75 km)  
 Max oil well depth ~ 40,000 ft (12 km)

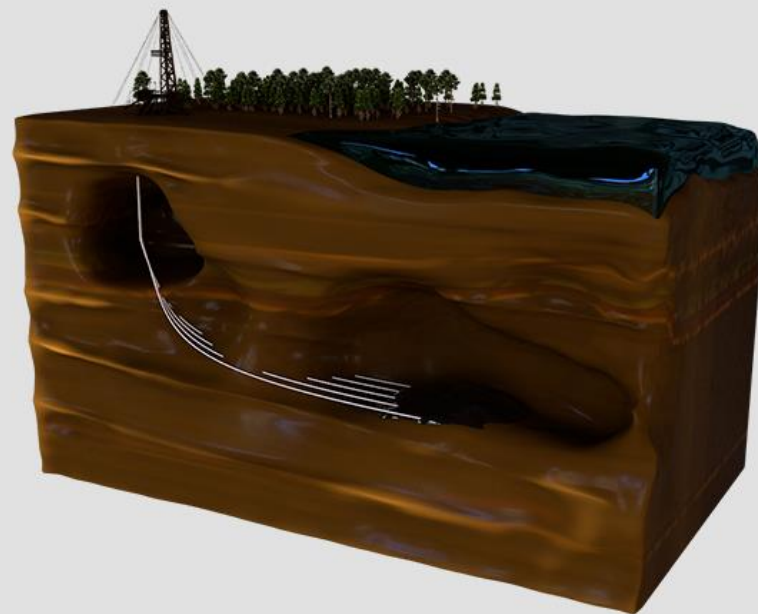
- Deep water drilling rig rates in 2015 = \$520,000/day.
- 100 days of drilling can cost around \$100 million.



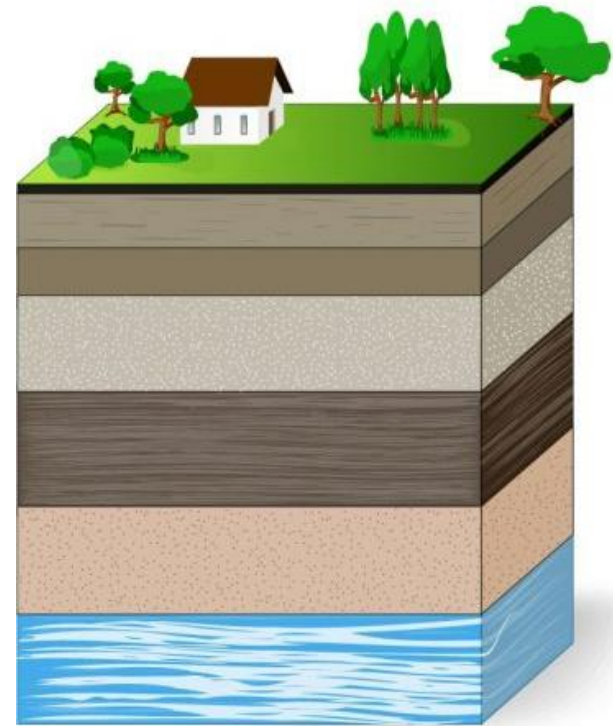
## HOW FAR DOWN IS THAT?

Drilling of wells and boreholes has only penetrated about a third of the way into the Earth's crust.

Today companies are going to unprecedented depths to secure earth's last remaining oil wells. Sometimes they have to drill sideways to reach the oil spot.



**Water wells** typically range from 3 to 18 metres (10–60 ft) **deep**, but in some areas can go deeper than 900 metres
















**Deepest Buildings, JINPING UNDERGROUND LABORATORY, CHINA – 7,900 FEET DEEP (2400 m)**

Nuclear test carried out at depth 200-800m

Depth of Burj Khalifa, the tallest building – 164 ft (50 m)

Soil investigation for 50 m deep foundation goes deeper

# TYPES OF ROCKS

<b>IGNEOUS</b>	<b>SEDIMENTARY</b>	<b>METAMORPHIC</b>				
 Granite	 Scoria	 Sandstone	 Limestone	 Marble	 Slate	
 Pumice	 Obsidian	 Shale	 Conglomerate	 Gypsum	 Quartzite	 Gneiss

<https://www.forbes.com/sites/trevornace/2019/08/25/3-types-of-rocks/#2fdb85094686>

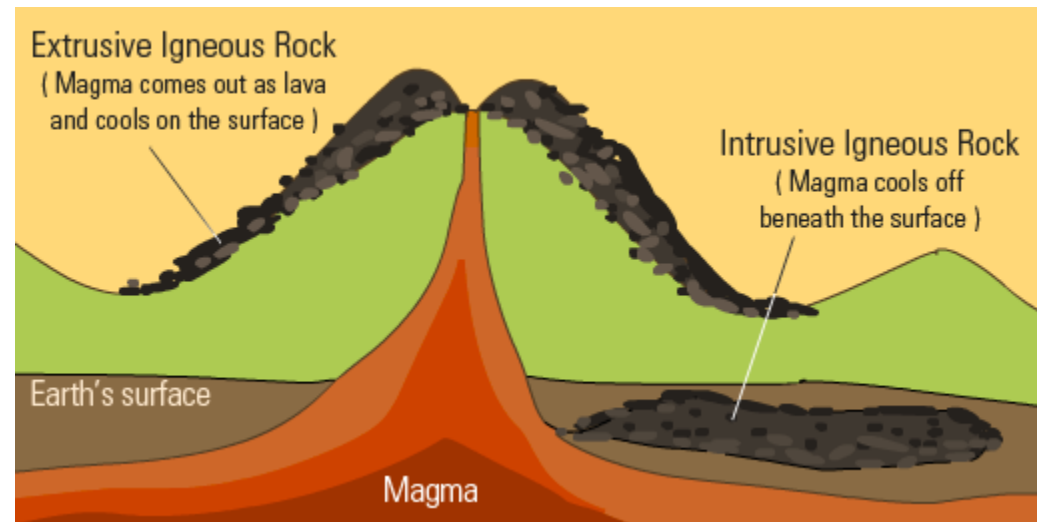
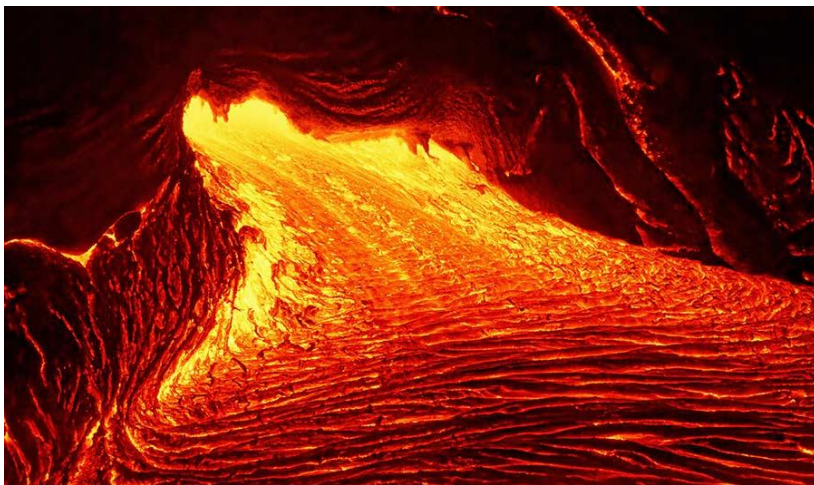
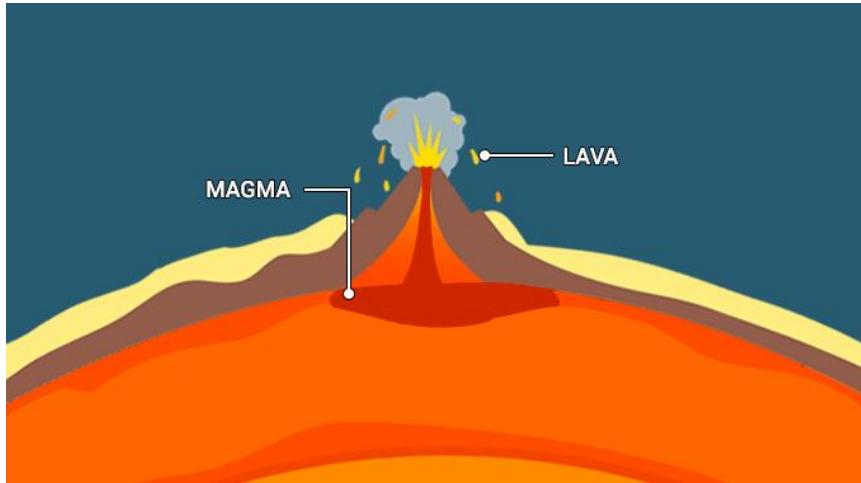


# Types of Rocks

- Sedimentary, igneous and metamorphic

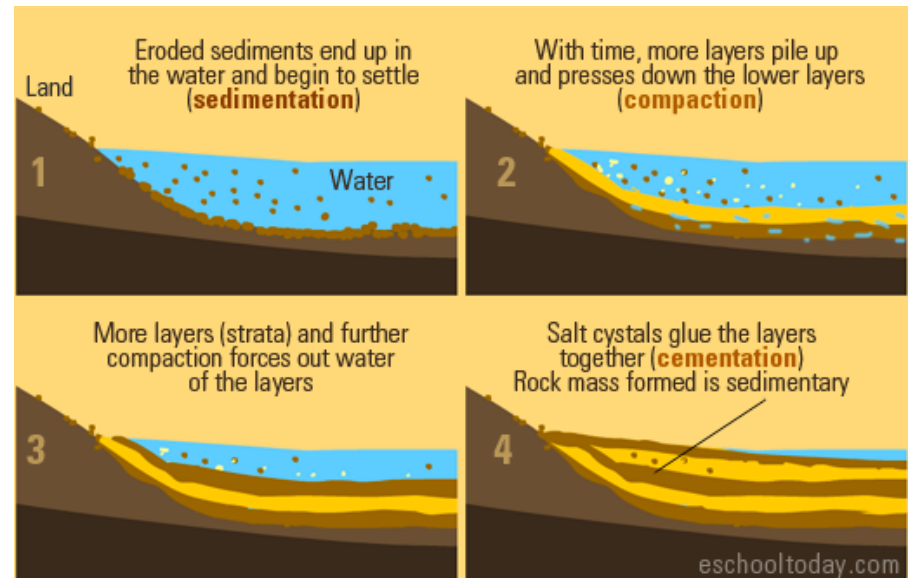
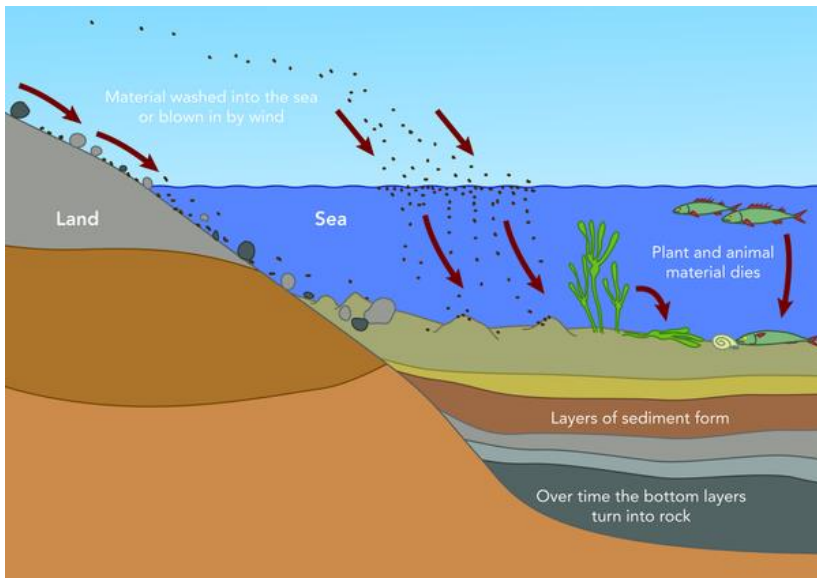


# Igneous Rocks

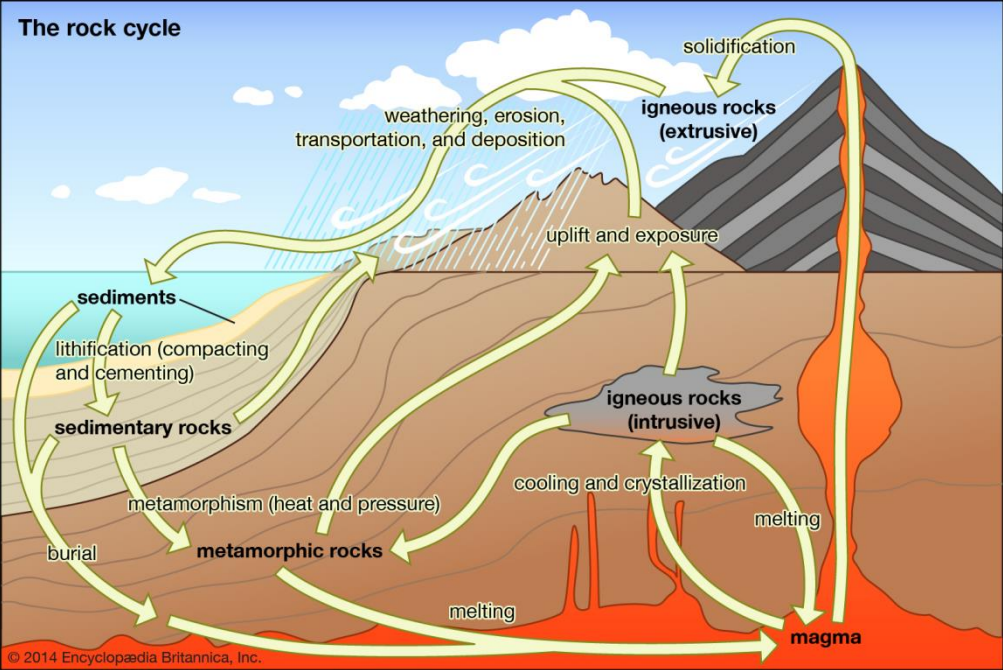
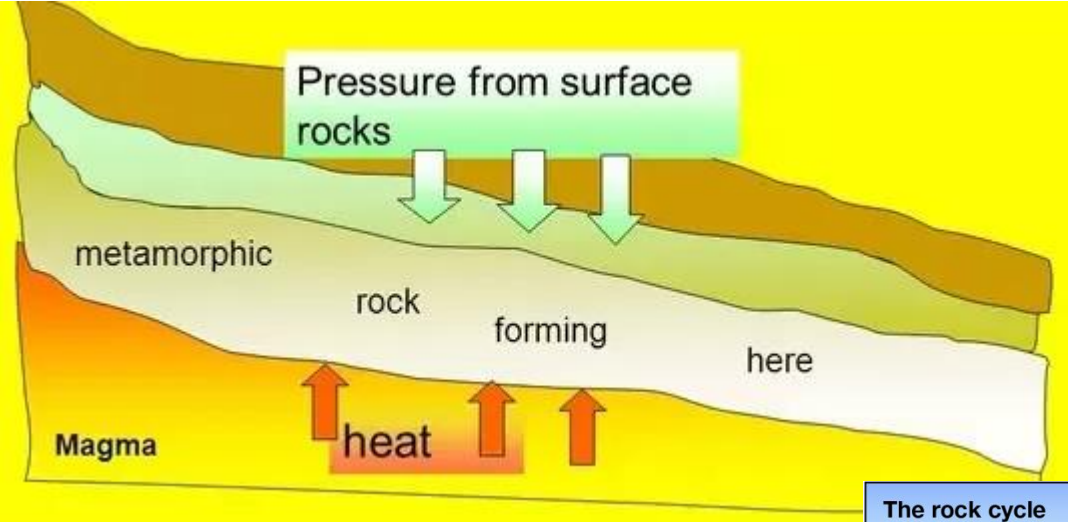




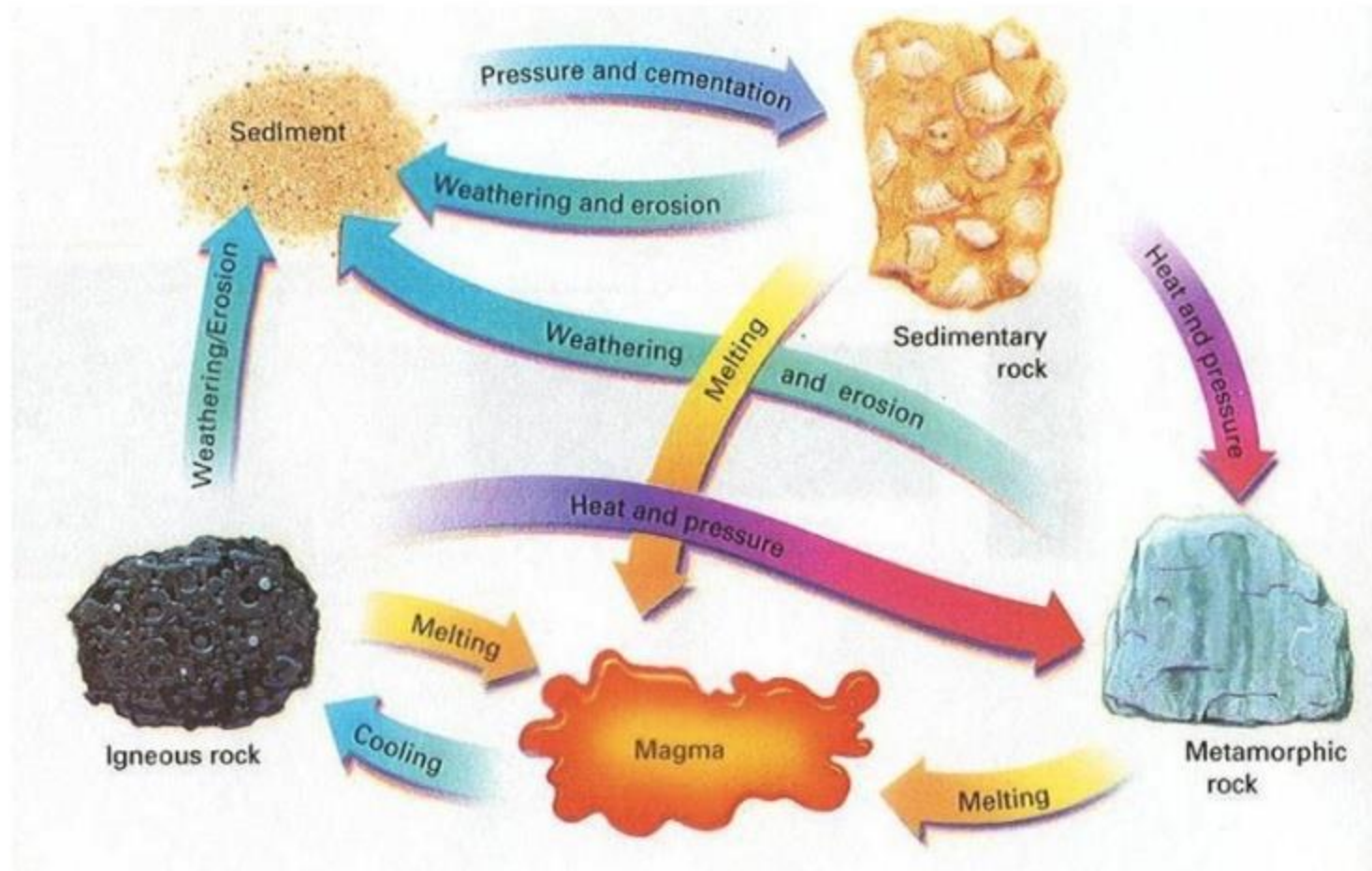
# Sedimentary Rocks

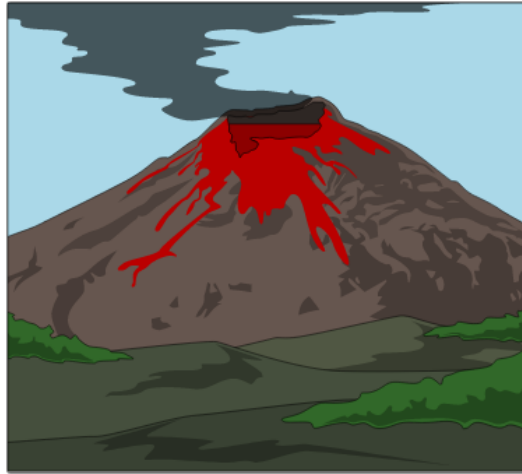


# Metamorphic Rocks

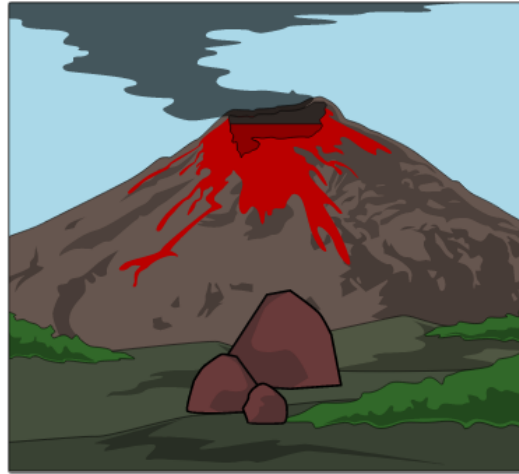


# Formation of Sedimentary Rock

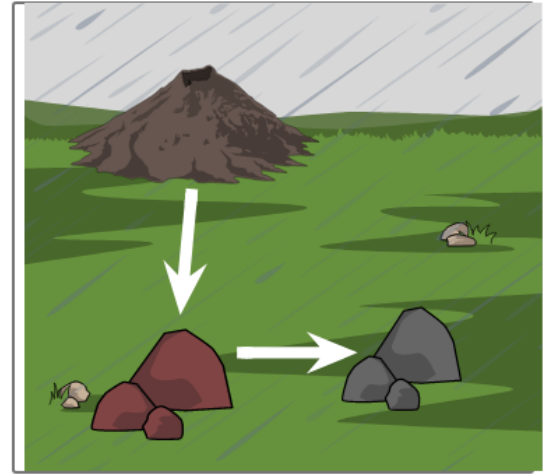




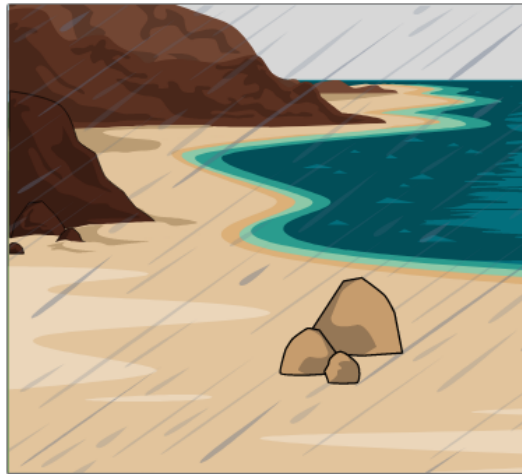
Step number one in the rock cycle is: a volcanic eruption. This occurs through the movement of tectonic plates causing magma to rise and erupt. Magma is a hot liquid made of melted minerals.



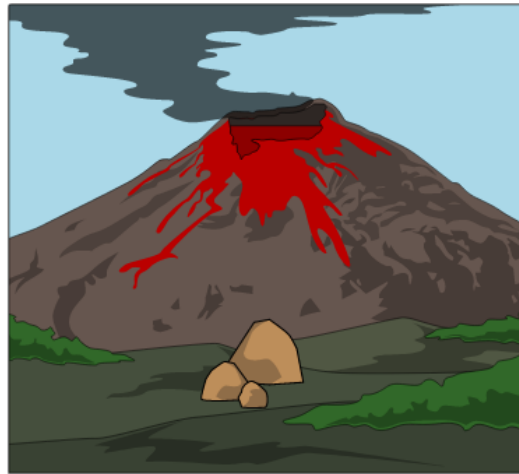
After the volcano erupts the magma cools down and hardens, creating an igneous rock. Igneous rock can form underground, or above ground, however the temperature must be cool.



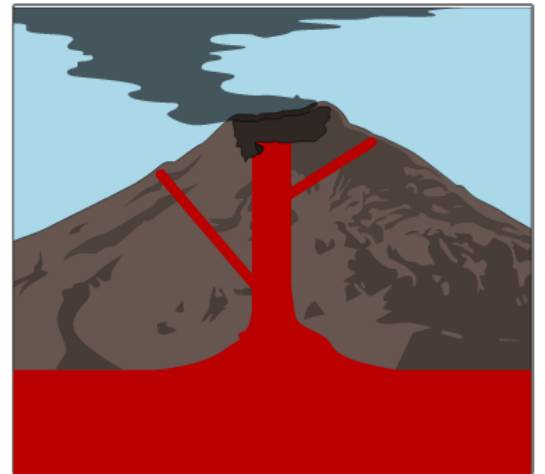
After the igneous rock has been formed, it creates a process called sedimentary. Sedimentary is when rain and cooler temperatures causes the rock to break into the smaller pieces, which can be blown away from the wind.



After many years, they can blow to an area near water. The sediments come together with shells, water, sand and pebbles creating sedimentary rock. It can take so long for a sedimentary rock to form that they are often found underneath the earth.



When tectonic plates collide and rub together it creates friction causing extreme heat. This process is called metamorphosis and creates a metaphoric rock. This rock makes up volcanos and mountains.



If it creates a mountain the rock can be broken and washed away by streams, turning into sedimentary rock. This continues the rock cycle. If it creates a volcano the metamorphic rock melts which turns into magma. This also continues the rock cycle.



# Minerals in Rocks

A mineral is a solid formation that occurs naturally in the earth while a rock is a solid combination of more than one mineral formations which is also occurring naturally.

A mineral has a unique chemical composition and is necessarily defined by its crystalline structure and shape. On the other hand, since a rock can be composed of several minerals it is classified according to the process of its formation. A rock can also contain organic remains and mineraloids apart from regular mineral formations. There are some rocks that may include just one mineral formation though.

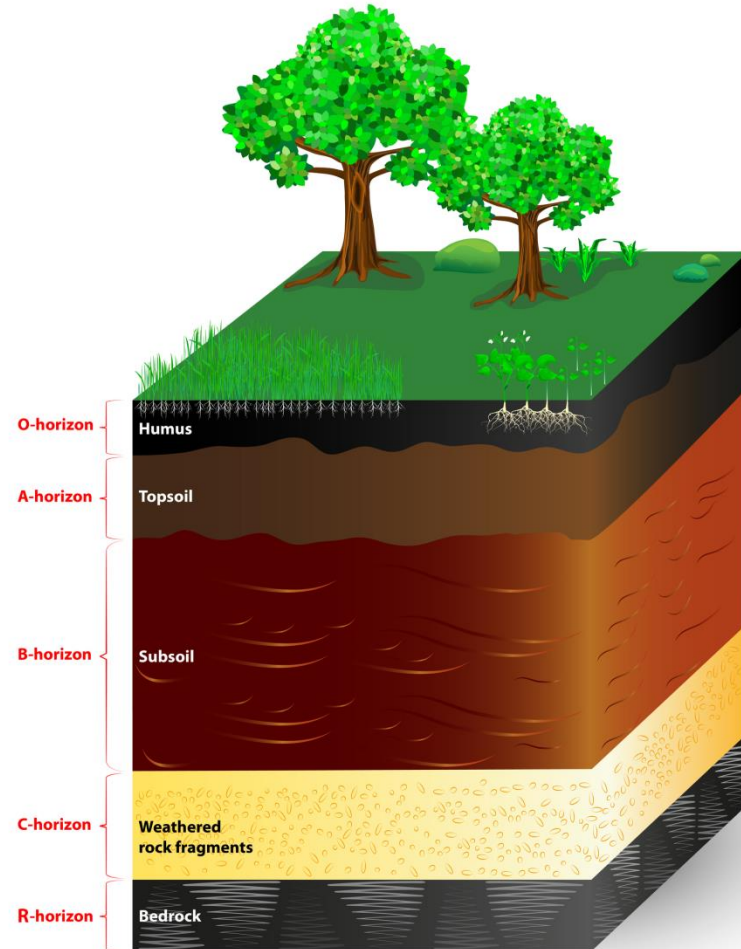
The commercial value of minerals is immense and rocks are mined to extract these minerals. Such rocks are known as ores and the residue of the rock after the mineral has been extracted is called tailing.

The classification of rocks also depends on their mineral and chemical composition, texture and the process of formation. Rocks are therefore classified as igneous, sedimentary and metamorphic. A rock cycle defines how one rock form changes to another. For example, a sedimentary rock form is limestone that is composed only of the mineral calcite.

# Rock vs Soil



## SOIL LAYERS

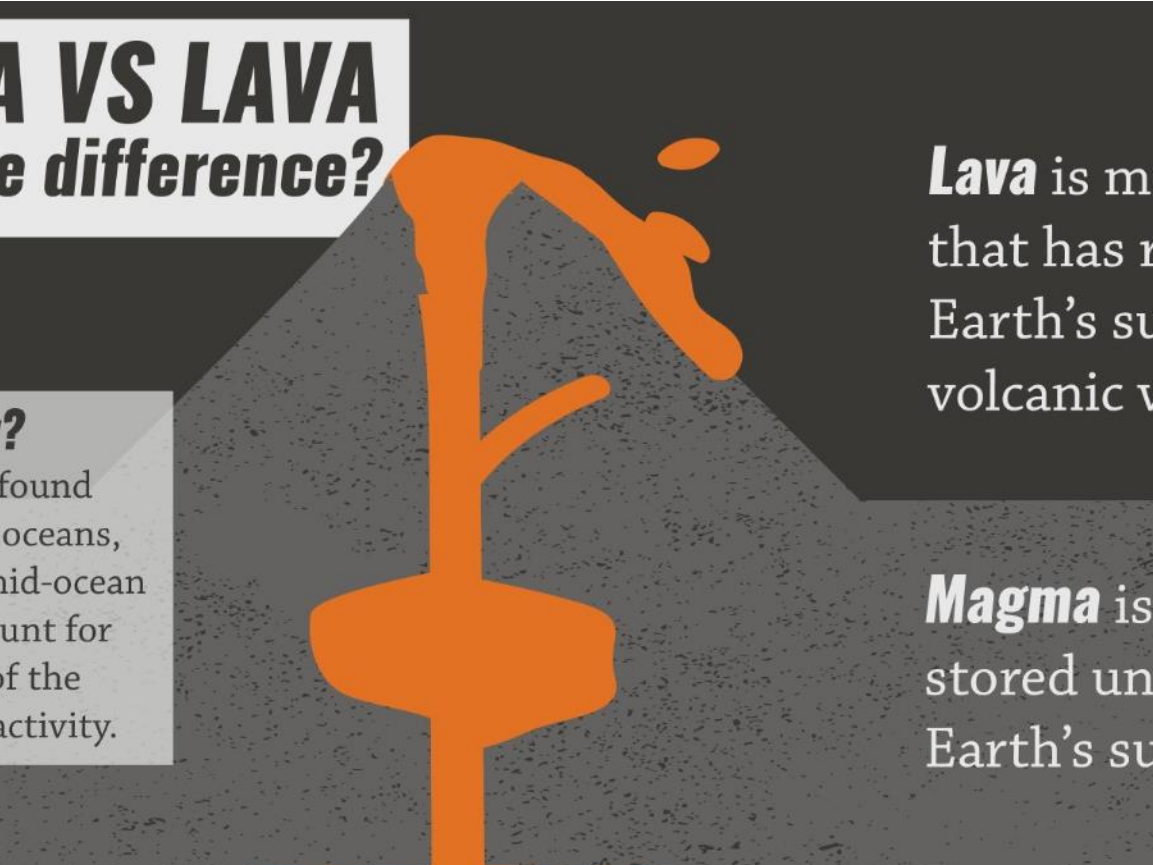


# Volcanic Activity

## **MAGMA VS LAVA** *What's the difference?*

### ***Did you know?***

Lava can also be found at the bottom of oceans, in places called mid-ocean ridges. They account for more than 75% of the Earth's volcanic activity.



**Lava** is molten rock that has reached the Earth's surface through volcanic vents.

**Magma** is molten rock stored under the Earth's surface.